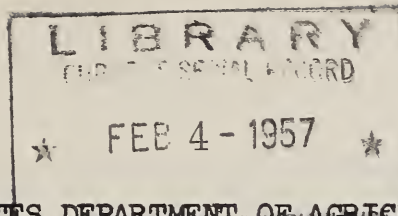


## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



A43.9  
R31  
Cop. 2



ARS 52-35  
December 1956

UNITED STATES DEPARTMENT OF AGRICULTURE  
Agricultural Research Service  
Dairy Husbandry Research Branch  
Beltsville, Md.

## HOW TO MAKE UP AN ECONOMICAL DAIRY RATION

It is always good business, in making up a dairy ration, to use feeds that will furnish the most total digestible nutrients at the least cost and at the same time supply enough digestible protein. The amount of protein to supply in the form of grains and other concentrates will depend on the quality (protein content) of the hay, silage, or other roughage that is being fed.

Table 1 shows the approximate amount of protein needed in the concentrate mixtures fed with roughages of different quality, and the proportionate amounts of high-, medium-, or low-protein feeds to use in making up the concentrate mixture.

Table 2 lists the most common feeds in the low-, medium-, and high-protein groups. The number in parentheses after each feed refers to the column in table 3 which gives the cost of 100 pounds of total digestible nutrients in that particular feed when the price of the feed ranges from \$25 to \$100 a ton.

## HOW TO USE THE TABLES

Suppose your roughage consists of first-quality mixed clover and timothy hay, and also good corn silage. According to table 1, this would be "B" quality roughage and it would be necessary to feed a concentrate mixture containing from 14 to 15 percent of protein.

Now, suppose that you have the following feeds or that you can buy them on the market at the prices indicated:

Wheat bran at \$65; No. 2 corn at \$60; Oats at \$50; Molasses (cane) at \$40; Corn gluten feed at \$70; Linseed meal at \$80; Cottonseed meal at \$90; and Barley at \$55.

Referring to the list of feeds (table 2) you will find wheat bran in the "medium-protein group" and after it the number (8). Column 8 in table 3 gives \$4.58 as the cost of 100 pounds for total digestible nutrients in wheat bran at \$65 a ton. Following a similar procedure for each of the other feeds gives the following costs:

Cost per 100 pounds T.D.N.

Low-protein feeds:

Corn, No. 2 grade, at \$60 a ton-----	\$3.90
Barley, at \$55 a ton-----	3.48
Molasses, cane, at \$40 a ton-----	4.82
Oats, at \$50 a ton-----	3.52

Medium-protein feeds:

Wheat bran, at \$65 a ton-----	4.58
Corn gluten feed, at \$70 a ton-----	5.19

High-protein feeds:

Linseed meal, old process, at \$80 a ton-----	4.82
Cottonseed meal, at \$90 a ton-----	6.00

Now, according to table 1, the concentrate mixture to be fed with "B" quality roughage should have 6 parts of low-protein feeds, 2 parts of medium-protein feeds, and 2 parts of high-protein feeds. Since barley is the cheapest of the 4 low-protein feeds, this part of the roughage would consist of 6 parts of barley. Since wheat bran is cheaper than corn gluten feed, the medium-protein feeds in the ration would preferably be 2 parts of wheat bran; and since linseed meal is the cheaper of the two high-protein feeds available, this part of the mixture would be 2 parts linseed meal. The final mixture, therefore, would be 6 parts barley, 2 parts wheat bran, and 2 parts linseed meal (all parts by weight).

This will give a concentrate mixture of approximately 14 percent protein, which is a liberal amount of protein for feeding with roughage of the "B" quality. Mixtures made up of a few ingredients are just as good as those made up with numerous ingredients. With excellent quality legume roughage single grains, such as corn, oats, barley, or a mixture of them, with 10 to 20 percent wheat bran or mill run, makes a good, low-cost mixture. Farmers purchasing ready-mixed concentrates should choose mixtures with a protein content to fit their forage, as indicated in table 1. Make sure that it has a low fiber content and includes ingredients that are rich in total digestible nutrients. Feeding more protein than is needed is expensive.

#### FEEDING THE DAIRY COW

Each cow should get all the roughage she will eat, and this should provide nutrients for considerable milk. A concentrate mixture should be fed to obtain additional milk. Because nutrients in forage cost less than nutrients in grain, feed costs can be kept down by getting as **much** production out of forage as possible. A good guide is to **have** cows consume each day the equivalent of at



least 2 1/2 pounds of hay per day per 100 pounds of body weight, a 1,000-pound cow 25 pounds per day. The more forage cows will eat the less grain you will need to get good production and economical production. Just how much grain to feed is hard to say since it depends on so many factors. Since grain generally is the highest cost feed, watch the feed-price milk-price ratio in your locality. A good rule is to feed all the good forage cows will eat and then add grain in increasing amounts to the extent that each added unit of grain returns more in income from the extra milk than the grain costs.

For the majority of farmers a general guide for feeding grain under average barn feeding conditions when milk, hay, and grain mixture prices are at different levels, is given in table 4. The recommendations in this table are derived from experiments in which cows were fed grain at different levels, together with plenty of average quality forage, and the milk production measured. It takes into account also the milk-grain price ratio and the milk-hay price ratio for different price relationships.

More concentrate is recommended when it is cheap in relation to hay and less when grain is expensive in relation to hay. Also, more concentrate is recommended when milk prices are high in relation to either grain or hay, or both. Here is the way to use this table as a guide to feeding grain to your cows. Suppose milk sells for \$3.25 per 100 pounds, grain costs \$3.00 per 100 pounds, and your hay is valued at \$25 per ton. Locate \$3.25 in the first left hand column. Then locate the \$25 row for hay in the second column. Then locate \$3.00 per hundred column for grain, in this case in the 5th column. Go down this column until it intersects the \$25 hay row in the \$3.25 value of milk row. The figure is 4. This tells you that you should feed 1 pound of grain for each 4 pounds of milk per cow per day for the most profitable level for feeding grain. Likewise, when milk sells for \$4.25, hay costs \$30, and grain costs \$3.50, the rate of grain feeding would be 1 to 3.5 pounds of milk produced daily. Farmers with plenty of top quality forage can feed 20 to 25 percent less grain than recommended in this guide.

A guide to feeding cows on pasture is given in table 5. The recommendations for feeding milk cows given in these tables have been thoroughly tested and if followed will give economical milk production under most conditions.

Table 1.- Concentrate mixtures to feed with different roughages

Quality of roughage fed	Protein content needed in concentrate mixture	To make up the concentrate mixture, use the following proportions of---		
		Low-protein feeds	Medium-protein feeds	High-protein feeds
	<u>Percent</u>	<u>Parts</u>	<u>Parts</u>	<u>Parts</u>
(A) First-quality legume hay or silage or better than average pasture-----	12	6	3	1
(B) Average-quality legume hay or silage, or first-quality mixed hay or silage, or corn and sorghum silage or average pasture-----	14	6	2	2
(C) Average-quality mixed hay and corn or sorghum silage or below average pasture--	16	5	2	3
(D) Grass hay and corn silage--	18	4	3	3



Table 2.- List of common dairy feeds, with a code number after each feed that refers to the column of the same code number in table 13

LOW-PROTEIN FEEDS			MEDIUM-PROTEIN FEEDS			HIGH-PROTEIN FEEDS		
Alfalfa-molasses feed-----	(15)	Kafir grain-----	(3)	Beans, field-----	(6)	Corn gluten meal-----	(3)	
Barley-----	(4)	Milo head chops-----	(5)	Brewers' grains, dried-----	(11)	Cottonseed meal-----	(6)	
Beet pulp, dried-----	(8)	Milo grain-----	(4)	Coconut oil meal, old process-----	(3)	Fish meal-----	(10)	
Corn bran-----	(6)	Molasses, beet-----	(14)	Corn gluten feed-----	(5)	Linseed meal, old process-----	(4)	
Corn, well-dried-----	(2)	Molasses, cane-----	(15)	Distillers' corn grains, dried-----	(1)	Linseed meal, solvent process-----	(7)	
Corn, No. 2 grade-----	(3)	Oats-----	(8)	Distillers' grains, mixed dried-----	(6)	Peanut-oil-meal, old process-----	(2)	
Corn-and-cob meal-----	(6)	Oat mill feed-----	(16)	Peas and pea feed-----	(4)	Peanut-oil-meal, solvent process-----	(7)	
Distillers' rye grains, dried-----	(12)	Orange pulp, dried-----	(4)	Peanut skins-----	(9)	Peanuts, whole pressed-----	(15)	
Feterita grain-----	(9)	Potato flour-----	(5)	Rye middlings-----	(5)	Skim milk, dried-----	(2)	
Feterita head chops-----	(4)	Potato pomace, dried-----	(9)	Wheat bran-----	(8)	Soybeans-----	(1)	
Grapefruit refuse, dried-----	(6)	Rye-----	(3)	Wheat middlings-----	(4)	Soybean-oil-meal, expeller process-----	(2)	
Hegari grain-----	(3)	Sorghum grain-----	(6)	Yeast grains, dried-----	(13)	Soybean-oil-meal, solvent process-----	(5)	
Hominy feed-----	(1)	Wheat-----	(2)			Yeast, dried-----	(6)	
Rice bran-----	(10)							

Table 3.- Cost of 100 pounds of total digestible nutrients in various feeds at different prices per ton of feed

Cost of feed per ton	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
25-----	1.47	1.51	1.54	1.56	1.62	1.67	1.71	1.76	1.81	1.87	1.92	1.98	2.05	2.12	2.19	2.91
30-----	1.76	1.81	1.85	1.90	1.95	2.00	2.05	2.11	2.17	2.24	2.31	2.38	2.46	2.54	2.63	3.49
35-----	2.06	2.11	2.16	2.22	2.27	2.33	2.40	2.46	2.54	2.61	2.69	2.78	2.87	2.97	3.07	4.07
40-----	2.35	2.41	2.47	2.53	2.60	2.67	2.74	2.82	2.90	2.99	3.08	3.17	3.28	3.39	3.51	4.65
45-----	2.65	2.71	2.78	2.85	2.92	3.00	3.08	3.17	3.26	3.36	3.46	3.57	3.69	3.81	3.95	5.23
50-----	2.94	3.01	3.09	3.16	3.25	3.33	3.42	3.52	3.62	3.73	3.85	3.97	4.10	4.24	4.39	5.81
55-----	3.24	3.31	3.40	3.48	3.57	3.67	3.77	3.87	3.99	4.10	4.23	4.37	4.51	4.66	4.82	6.40
60-----	3.53	3.61	3.70	3.80	3.90	4.00	4.11	4.23	4.35	4.48	4.62	4.76	4.92	5.08	5.26	6.98
65-----	3.82	3.92	4.01	4.11	4.22	4.33	4.45	4.58	4.71	4.85	5.00	5.16	5.33	5.51	5.70	7.56
70-----	4.12	4.22	4.32	4.43	4.55	4.67	4.79	4.93	5.07	5.22	5.38	5.56	5.74	5.93	6.14	8.14
75-----	4.41	4.52	4.63	4.75	4.87	5.00	5.14	5.28	5.43	5.60	5.77	5.95	6.15	6.36	6.58	8.72
80-----	4.71	4.82	4.94	5.06	5.19	5.33	5.48	5.63	5.80	5.97	6.15	6.35	6.56	6.78	7.02	9.30
85-----	5.00	5.12	5.25	5.38	5.52	5.67	5.82	5.99	6.16	6.34	6.54	6.75	6.97	7.20	7.46	9.89
90-----	5.29	5.42	5.56	5.70	5.84	6.00	6.16	6.34	6.52	6.72	6.92	7.14	7.38	7.63	7.89	10.47
95-----	5.59	5.72	5.86	6.01	6.17	6.33	6.51	6.69	6.88	7.09	7.31	7.54	7.79	8.05	8.33	11.05
100-----	5.88	6.02	6.17	6.33	6.49	6.67	6.85	7.04	7.25	7.46	7.69	7.94	8.20	8.47	8.77	11.63
105-----	6.18	6.33	6.48	6.65	6.82	7.00	7.19	7.39	7.61	7.84	8.08	8.33	8.61	8.90	9.21	12.21
110-----	6.47	6.63	6.79	6.96	7.14	7.33	7.53	7.75	7.97	8.21	8.46	8.73	9.02	9.32	9.65	12.79
115-----	6.76	6.93	7.10	7.28	7.47	7.67	7.88	8.10	8.33	8.58	8.85	9.13	9.43	9.75	10.09	13.37
120-----	7.06	7.23	7.41	7.59	7.79	8.00	8.22	8.45	8.70	8.96	9.23	9.52	9.84	10.17	10.53	13.95
125-----	7.35	7.53	7.72	7.91	8.12	8.33	8.56	8.80	9.06	9.33	9.62	9.92	10.25	10.59	10.96	14.53
130-----	7.65	7.83	8.02	8.23	8.44	8.67	8.90	9.15	9.42	9.70	10.00	10.32	10.66	11.02	11.40	15.12
135-----	7.94	8.13	8.33	8.54	8.77	9.00	9.25	9.51	9.78	10.07	10.38	10.71	11.07	11.44	11.84	15.70

Table 4.- Estimated most profitable level to feed grain at different price relationships for milk, grain and hay (or hay equivalent.)

Value of 100 lbs. of milk:	Value of ton of hay - dollars	Value of grain mixture - dollars per 100 lbs.:-					
		\$2.00	\$2.50	\$3.00	\$3.50	\$4.00	
The recommended feeding is 1 lb. of grain mixture daily for the indicated lbs. of milk produced.							
\$2.75-----	20	3.0	4.5	6.0	9.0	22.0	
	25	2.5	3.5	5.0	8.0	16.0	
	30	2.3	3.3	4.5	7.0	14.0	
	35	1.8	3.0	4.0	6.0	10.0	
	40	1.5	2.5	3.5	5.5	8.0	
\$3.25-----	20	2.5	3.5	4.2	6.0	10.0	
	25	2.3	3.2	4.0	5.7	8.5	
	30	2.0	3.0	3.5	5.0	7.0	
	35	1.7	2.5	3.2	4.5	6.5	
	40	1.5	2.2	3.0	4.0	6.0	
\$3.75	20	2.3	3.0	3.7	5.0	7.0	
	25	2.0	2.7	3.5	4.5	6.0	
	30	1.8	2.5	3.3	4.0	5.5	
	35	1.5	2.3	3.0	3.8	5.0	
	40	1.0	1.5	2.5	3.3	4.5	
\$4.25-----	20	2.5	2.8	3.5	4.0	5.0	
	25	2.0	2.5	3.2	3.8	4.5	
	30	1.8	2.3	3.0	3.5	4.3	
	35	1.5	2.0	2.6	3.3	4.0	
	40	1.2	1.8	2.5	3.0	3.5	
\$4.75	20	2.0	2.5	3.0	3.5	4.5	
	25	1.7	2.3	2.8	3.5	4.0	
	30	1.5	2.0	2.5	3.2	3.8	
	35	1.2	1.8	2.3	3.0	3.6	
	40	1.0	1.5	2.0	2.5	3.5	



Table 5.- Supplementary feeding schedule for cows on pasture

Butterfat test of milk (percent)	: Pounds of milk daily : that pasture alone : might produce		: Pounds of hay, corn silage, or : concentrates needed to produce : each additional 5 pounds of milk : daily			
	: Good : pasture <sup>1/</sup>	: Average : pasture <sup>2/</sup>	: Hay <sup>3/</sup>	: Corn : silage <sup>3/</sup>	: Concentrates	
3-----	: 40	: 20	: 3.3	: 10.0	: 2.0	
4-----	: 30	: 15	: 3.7	: 11.0	: 2.2	
5-----	: 25	: 12	: 4.2	: 12.5	: 2.5	
6-----	: 20	: 10	: 4.7	: 14.0	: 2.8	

1/ Good pasture is young and succulent and abundant enough so that cows can graze their fill in 1 to 1 1/2 hours several times daily.

2/ Average pasture is short and young or of somewhat advanced growth and is not palatable or abundant enough to permit cows to graze their fill in 2 to 3 hours several times daily. Poor pasture will no more than maintain the weight of cows. Some hay, silage, and/or grain may be necessary for cows to maintain their weight if the pasture is very poor.

3/ If hay and silage are fed together, 3 pounds of silage will replace 1 pound of hay. Six-tenths of a pound of concentrates will furnish as much total digestible nutrients as 1 pound of hay or 3 pounds of silage.



APRIL2013



RIGHT

HUAJIE 华基文具 H.3201

HUAJIE 华基文具 H.3201



